Task 3.8

MONITORING NETWORK WORK PLAN
(Surface Water and Treatment System Monitoring)

for the project entitled

Dairy Best Available Technologies in the Okeechobee Basin

(SFWMD Contract No. C-11652)

Submitted by

SWET, Inc.
Soil and Water Engineering Technology, Inc.

In Association With

MOCK•ROOS
CH2M HILL
ENTEL

April 27, 2004

The SWET Team

Task 3.8
Final
MONITORING NETWORK WORK PLAN
(Surface Water and Treatment System Monitoring)

For Project Entitled

DAIRY BEST AVAILABLE TECHNOLOGIES IN THE OKEECHOBEE BASIN

South Florida Water Management District
Contract No. C-11652

Developed by

SOIL AND WATER ENGINEERING TECHNOLOGY, INC.

In association with

MOCK, ROOS & ASSOCIATES, INC.,

CH2M HILL

And

ENTEL ENVIRONMENTAL COMPANIES, INC.

April 27, 2004

The information provided in this report has been prepared under my direct supervision and is intended to be in conformity with modern engineering principles applicable to water resource monitoring.

Signed and Sealed by

_____

Adelbert (Del) B. Bottcher, Ph.D., P.E.
License No. PE0031056

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INTRODUCTION

This monitoring work plan presents the activities and procedures that will be used by Soil & Water Engineering Technology, Inc. (SWET) and its subconsultants, Mock, Roos & Associates, Inc. (Mock·Roos), CH2M Hill (CH2M), and ENTEL Environmental Companies, Inc. (ENTEL), to complete monitoring aspects of the project entitled "Dairy Best Available Technologies in the Okeechobee Basin" for the South Florida Water Management District (herein referred to as the District). The project has been divided into two phases that include for Phase I, dairy assessment and ranking; develop Comprehensive Nutrient Management Plans (CNMPs); technologies formulation, and monitoring plans development. Phase II includes implementation of selected technologies, installation and testing monitoring stations; collection of bi-weekly surface water samples, and evaluation of alternative performance.

This plan covers the monitoring activities associated with determining the treatment effects of the installed edge-of-farm chemical treatment systems on the dairies. This includes the monitoring of the existing conditions that may or may not be impacted by the new treatment systems and two or three new sites that are located on the inflow and outflow points of the actual treatment system. Flow and water quality (total phosphorus, TP) will be measured at all the monitoring sites (up to five flow locations per dairy), while TSS and fecal bacteria will be continued to be measured for monthly grab samples taken at the nine existing condition sites. The existing farm discharge sites are assumed to represent both surface and subsurface flow from the dairy because the flatwoods soils on the dairies prevent deep ground flow, and therefore most, if not all, shallow groundwater will reemerge within field and farm ditches upstream of the monitoring location. Monitoring will continue at the remaining (some were eliminated by the implemented systems) existing locations throughout the project to obtain a before and after picture of the net P discharge from the dairies as influenced by the implemented technology(ies). The two (three at Dry Lake) new monitoring sites per dairy, designated as T-Inflow and T-Outflow and an extra T-Mid site at Dry Lake were installed to specifically test the performance of the treatment system (see individual dairy monitoring details below).

Objectives

The overall objective of the monitoring activities is to determine the phosphorus (P) removal efficiency of the technology(ies) to be applied to the dairies and if the targeted goal of 40 ppb P in the dairies' discharge waters can be obtained. The specific tasks associated with the overall monitoring program are:

Phase I
1. Develop monitoring plan for up to three monitoring sites for the existing flow and water quality conditions on the three selected dairies.
2. Locate and develop monitoring site maps for up to three monitoring stations per dairy.
3. Develop a Department of Environmental Protection (FDEP) approved Quality Assurance Project Plans (QAPPs) for the project.

Phase II
4. Install and test monitoring equipment for existing condition monitoring.

5. Finalize contractual arrangement for laboratory.
6. Conduct routine sample collection activities for existing condition monitoring.
7. Develop monitoring plan for up to two monitoring sites per dairy for evaluating the performance of the implemented technology(ies) on the three selected dairies.
8. Locate and develop monitoring site maps for up to two monitoring stations per dairy.
9. Develop/modify Department of Environmental Protection (FDEP) approved Quality Assurance Project Plan (QAPP) for additional monitoring sites.
10. Install and test monitoring equipment for technology monitoring.
11. Perform routine quality assurance assessments of monitoring activities.
12. Process and develop reports on monitoring activities and technology(ies) performance.

FLOW AND WATER QUALITY MONITORING PLAN

The development of this monitoring plan is Task 3.8 under the project's scope of work. This monitoring plan will describe the monitoring activities associated with the treatment evaluation phase of the monitoring program. The monitoring sites presented in this plan should be considered final. Updated QAPPs for each dairy are attached for informational purposes only. These forms are no longer required by FDEP.

Monitoring Approach and Station Configuration

The goal of the monitoring program is to measure as accurately as possible the dairies' outflow and total phosphorus (TP) concentrations prior to and after the implementation of the new treatment systems, as described in the Task 3.7 final report (Implementation Plan). This final phase of monitoring is specifically designed to better quantify the potential benefits of the installed technology. The before (existing condition) implementation sampling tim period was limited because sampling did not start until Phase II was approved. The existing condition sampling locations, as much as possible, were located at existing District monitoring locations, but the overall intent is to representatively monitor as much of the water leaving the dairies as possible. Two to four automated sampling stations were installed at each dairy for the existing condition monitoring program, but two of these sites have since been eliminated by the treatment system construction and one site had to be reinstalled (see individual monitoring descriptions below). Two new stations have been assigned for each dairy to directly monitor the inflows and outflow of the treatment system. However, due to the physical layout of the Dry Lake treatment system, three new stations will be used there. The specific locations of all monitoring sites are provided in the attached QAPP plans for each dairy.

The existing and new treatment monitoring stations have automated flow and sampling equipment to provide continuous flow records and flow-proportional water sampling. The ISCO Model 6712 Auto Samplers with an ISCO Model 750 Low Profile Area Velocity Flow Module are or will be installed at each monitoring station. The flow module has a broad beam Doppler sonic and depth transducer that provides average flow velocity and water depth (converted to cross-sectional area) through a closed conduit. A metal sleeve inserted within a

corrugated culvert is used to provide a better-defined control-section for flow measurements within these culverts. Open channel measurements are based on stream bottom profiles. The sonic and depth transducers are positioned on the bottom of the culvert or stream to minimize flow interference. An air bubbler is also installed just upstream of the Doppler sonic transducer to enhance signal strength for clear water conditions. The 6712 datalogger records the hourly average flow and integrates the flow volume passing the transducers to trigger the autosampler to take flow-proportional samples. Flow-proportional sampling will be accomplished by collecting 250 ml subsamples for every 0.25 cm of discharge into a 10 liter composite polypropylene bottle. Subsample and discharge sizes may vary depending on the flow conditions of the specific site.

A cellular phone and modem system is installed with each ISCO datalogger so that the stations can be remotely and routinely (daily) polled for data download and equipment status checks. Having remote access to the stations assists in sampling trip scheduling and reduces data loss due to equipment failure. Solar panels are installed to ensure continuous battery power for the stations.

The field monitoring equipment is housed in custom-built enclosures that are provided by the SFWMD. The enclosures, which are securely anchored against severe weather, also provide additional protection against weather, rodents, insects, vandals, and lightning strikes.

Equipment Setup, Calibration, and Maintenance

The new treatment monitoring stations will be installed as soon as possible once construction is near completion. The intent is to have the flow/sampler stations on-line before the start up of the treatments systems.

All monitoring equipment will be programmed and thoroughly tested after installation. The only equipment that will require calibration are the ISCO 6712 AutoSampler's subsample volume and the ISCO Modal 750 Velocity Flow Module average velocity measurement. Calibration of the subsample volumes will be done by physical measurement of sample volumes. The Flow Module comes pre-calibrated. Field calibration of this probe is very difficult. ISCO recommends that the best calibration verification is to verify zero velocity by placing the probe into a bucket of water. This should be done semi-annually. The best check for the velocity and depth probe is a routine review (weekly) of the sensor's data. Also, quarterly manual measurements of water depth and velocity using a portable staff gage and velocity meter is required. If problems are found with the velocity probe, then it must be returned to the vendor for repair and recalibration. Other equipment maintenance will be performed in accordance with the equipment manuals and the QAPP.

Sampling Procedures and Sample Handling

Two types of samples are being collected as part of this project. The first and primary samples are those collected by the autosamplers as flow weighted bi-weekly (on average) composite samples, which are only analyzed for TP. The second set of samples are monthly grab samples, which are only analyzed for TSS and fecal bacteria.

Sampling Schedule The targeted collection schedule for the autosampler composited samples is that they be collected biweekly over the project period. However, to maximize the information obtained from the monitoring program the following flexible banking protocol will be used:

> Two methods are used to schedule a sampling trip. First, rainfall patterns in the basin are tracked. Also, the monitoring stations are polled via cellular connection on a daily basis to determine the daily flow conditions and proper function. If no rainfall or monitored flow has occurred at the majority of the stations during the two-week sampling period, then the biweekly sampling trip may be banked. However, no two consecutive sampling trips will be banked, i.e. the stations will be visited for sample collection at least once a month regardless of flow conditions. During the two-week sampling period, the sampling crew will be dispatched to collect samples as soon as possible (target is within 48 hours) after any significant flow event. If banked sampling trips are available and a second significant flow event occurs during the two-week sampling period then the sampling crew will be dispatched to collect samples a second time or even a third time.

The TSS and fecal grab samples are collected once a month. These samples are collected during one of the biweekly sampling trips. When possible, the TSS and fecal samples are collected during the highest flow condition for the biweekly sampling trips. This is determined by tracking the rainfall in the basin, i.e. if the first biweekly period during a month had high rainfall or if an event triggered sampling trip occurred the TSS and fecal grab samples would be collected.

Sampling Periods The composite samples (autosampler) from the existing conditions (in-place) autosamplers are to be collected and analyzed for total phosphorus (TP) for 52 biweekly samplings over two years, which started in May 2002 and therefore will end in May 2004. If all sites have flow/samples every trip, then a maximum of 468 samples (3 samples per dairy times 3 dairies times 52 samplings) could be collected. Additional quality control (QC) samples are also collected in accordance with the QAPP, see Appendix A. The new treatment monitoring stations will follow the same sample schedule protocol given above, but will only be collected for 34 biweekly samplings after treatment startup. Since these treatment stations will be coming on line at different times due to different construction schedules, the 34 biweekly samplings will be staggered for dairies. However, the full 34 samplings will be completed for each dairy. If all of the new treatment sites have flow/samples every trip, then a maximum of 204 samples (2 samples per dairy times 3 dairies times 34 samplings) could be collected. No TSS or fecal samples are to be collected for the new treatment sites.

The TSS and fecal grab samples are being collected over the same time period as the above composite samples, except they will only be collected once per month. These additional grab samples will only be collected at the existing monitoring stations and only when flow is present. These samples will be analyzed for TSS and fecal coliform. If all sites have flow/samples, then a maximum of 234 samples (3 samples per dairy times 3 dairies times 26

samplings) would be collected. The TSS and fecal coliform grab samples will be collected as independent grab samples using a sterile sampling container from the dominant flow regime at the monitoring station.

Sampling Procedures This section provides a general summary of the sampling procedures. The FDEP's Standard Operating Procedures and the attached QAPPs have additional specifics on these procedures.

The water collected in the autosampler's composite bottle is well mixed before a subsample is poured into a pre-acidified sample bottle provided by the laboratory. If required by the QA protocol, a duplicate sample is also collected by simply filling a second lab supplied pre-acidified sample bottle. Following the FDEP's SOP for automatic samplers, the composite bottle is cleaned with soap, and then rinsed with DI water. If an equipment blank is scheduled then the final rinse water for the composite bottle is collected in a lab supplied pre-acidified sample bottle. Excess DI water shook from the composite bottles before being place empty back into the autosampler. No towel drying is permitted. Gloves are worn the entire time while handling the bottles.

The TSS grab sample is collected using a clean dipper and placed in an unpreserved bottle. The fecal coliform grab sample is collected using a sterile dipper and is preserved with sodium thiosulfate in a whril-pac bag. The grab samples will be collected and stored in accordance with FDEP's Standard Operational Procedures Version 001/01 (SOPs) with the following exception. The holding times for the fecal coliform have been approved by the District and FDEP to be extended from the normal 6 hours to 24 hours because of the long travel distances between the sites and the laboratory. The data from the exception will be qualified with a "Q" when submitted to the District.

Specific Monitoring Station Details

All of the dairies' QAPPs provided in Appendix A are similar except for the project site descriptions and maps. Figures 3.2 in the QAPPs show the monitoring locations for the existing and new treatment sites for Butler Oaks, Davie, and Dry Lake dairies. As can be seen, five monitoring sites are located on each of these dairies. In general, the existing sites were selected to capture as much of the dairies discharge and as little offsite on-flow as possible and the treatment site were placed at the inflow and outflow locations of the treatment system.

The physical parameters for each monitoring site are summarized in Table 1. The following section discusses the specific data for each monitoring site:

Butler 41A This site is located on the main drainage ditch on the southeast side of the property. After the construction of the treatment system, this site also receives the drainage that previously went out sites 41 and 41B. The velocity and depth sensor is placed on top of a concrete lintel lying on the bottom of the stream. Flow is determined by multiplying the velocity times the cross-sectional area of flow as determined by the stream bottom profile. P

Table 1. Physical Parameters Associated with the Dairy Project Monitoring Sites

Site Name	Phone # [(352) 538 XXXX]	ISCO Site ID	ISCO Software Code	Flow Between Samplings (Mgal)	Channel Shape	Diameter (in) or Top Width (ft)	Bottom Width (ft)	Height at Top Width (ft)	Level of Water (ft)	Vertical Offset (ft)	Suction Line Length (ft)	Flow Set Point For Alarm (cfs)	Height of Pump Above Inlet (ft)	Integrator Power Times
KREA 10D	3476	3.2255E+10	0881	2.487	Trapezoid	9.5	5	4		0	25	7.74	8	4-10-16-22
KREA 41			2709	0.149	Trapezoid	18	9	2.5		0	18	0.46	6	
KREA 41A	2865	3225481156	1171	2.899	Trapezoid	23	7	6		0	25	9.02	7	4-10-16-22
KREA 41B			1361	0.109	Pipe	36				0	17	0.03	6	
KREA 32B	3769	3225546719	3321	0.520	Pipe	72				*1.5*	*16*	*2*	*7*	4-10-16-22
KREA 49A	3282	3225481155	1091	0.567	Pipe	24				0	25	1.76	*6*	4-10-16-22
Davie North	3988	3225546718	3041	0.932	Pipe	52				1	25	2.9	6	4-10-16-22
Davie East	3535	3225546713	1641	3.781	Pipe	36				0	25	11.76	8	4-10-16-22
Davie South	3028	3225481159	*	5.266	Trapezoid	13	6.5	3		0	45	16.39	6	4-10-16-22
Davie T-In	4243	3294491833	2709	5.266	Pipe	48				0	45	16.39	6	4-10-16-22
Davie T-Out	3369	3225546712	1361	5.266	Wier	5.42				1.2	25	16.39	6	1-10-16
Butler T-In	5477	3225481174	*1121*	0.7	2-Pumps	See table below	-			*1*	*15*	*10*	*3*	1-10-16
Butler T-Out	5539	3225481157	*1251*	0.7	Wier	4	-			*1*	*15*	*10*	*7*	1-10-16
DryLake T-In	5537	3225546717	*2761*	0.520	Pump	See table below	-			*1*	*25*	*10*	*6*	1-10-16
DryLake T-Mid	5452	3225481175	*1201*	0.520	Pipe	18	-			*0*	*15*	*10*	*6*	4-10-16-22
DryLake T-Out	2617	3225481158	*1331*	0.520	Pipe	18	-			*0*	*25*	*10*	*6*	4-10-16-22

* Option 1109 is turned on but don't have the code

Dry Lake T-In

Level (ft)	Flow (cfs)
0	29.6
10	37.7
20	37.7

Butler T-In

Level (ft)	Flow (cfs)
0	9.4
2	10.8
5	23.2
10	24.2

load is determined by multiplying the flow times the P concentration of the composite sample over the period the sample was collected.

Butler 41 This site was located in the culvert under Boat Ramp Road, but has been abandoned because all of its drainage has been diverted to 41A.

Butler 41B This site was located on the center ditch that drained out of the east end of the property, but has been abandoned because all of its drainage has been diverted to 41A.

Butler 10D This site is located on the inflow ditch at the west end of the main dairy property. The velocity and depth sensor is placed on top of concrete blocks lying on the bottom of the stream. Flow is determined by multiplying the velocity times the cross-sectional area of flow as determined by the stream bottom profile. P load is determined by multiplying the flow times the P concentration of the composite sample over the period the sample was collected.

Butler T-In This site is located at the treatment pond inflow pumps. The sampler inlet sampler tube is located in the suction basin of the two pumps. Flow will be determined by the pump discharge curves and the suction head on the pumps. The ISCO sampler program was modified to calculate flow using a combined pump curve for the two pumps. The combine pump curve has the flow response for pump 1 until the water level reaches the start depth for the second pump. At this period the flow from both pumps are calculated together. To initiate a sampling cycle a contact closure signal is provided to the ISCO sampler from the pump control box when the chemical injection switch is turned on and any pump is started. P load is determined by multiplying the flow times the P concentration of the composite sample over the period the sample was collected.

Butler T-Out This site is located on the flashboard riser outflow structure on the treatment pond. Only the depth sensor is used at this site because of the outflow weir structure where flow can be determined directly and more accurately using a weir flow equation. The depth sensor will be placed near the pond bottom on the riser. P load is determined by multiplying the flow times the P concentration of the composite sample over the period the sample was collected.

Davie North This site is located on the main drainage ditch just south of the access road to barn 2. The velocity and depth sensor is installed on the downstream end and inside of a 52" dia CMP one foot off the culvert bottom. Flow is determined by multiplying the velocity times the cross-sectional area of flow within the culvert. P load is determined by multiplying the flow times the P concentration of the composite sample over the period the sample was collected.

Davie East This site is located in one of the two 36" dia CMP under a farm road on Nubbin Slough just west of Berman Road. The velocity and depth sensor is installed on the upstream end and approximate 4' into and on the bottom of one of the two culverts. Flow is determined by multiplying the velocity times the cross-sectional area of flow for both culverts. P load is

determined by multiplying the flow times the P concentration of the composite sample over the period the sample was collected.

Davie South This site is located on Nubbin Slough just before it leaves the dairy property. The velocity and depth sensor is placed on top of a concrete lintel lying on the bottom of the stream. Flow is determined by multiplying the velocity times the cross-sectional area of flow as determined by the stream bottom profile. P load is determined by multiplying the flow times the P concentration of the composite sample over the period the sample was collected.

Davie T-In This site is located on the inflow end of the 48" dia plastic culvert that diverts Nubbin Slough flow to the treatment system. The velocity and depth sensor is on the bottom of the culvert approximately 10' in from the inlet point. Flow is determined by multiplying the velocity times the cross-sectional area of flow within the culvert. P load is determined by multiplying the flow times the P concentration of the composite sample over the period the sample was collected.

Davie T-Out This site is located on the flashboard riser outflow structure on the treatment pond. Only the depth sensor is used at this site because of the outflow weir structure where flow can be determined directly and more accurately using a weir flow equation. The depth sensor is placed near the pond bottom on the boardwalk support post, so that both the depth over the weir and the pond depth can be recoreded. P load is determined by multiplying the flow times the P concentration of the composite sample over the period the sample was collected.

Dry Lake 32B This site is located at the discharge culvert from the Dry Lake Dairy on the western boundary. This site had to be shutdown during construction and then rebuilt on approximately the same location, but on a new 72" dia CMP that replaced the old culvert. The velocity and depth sensor is installed on the upstream end and the inside of the 72" dia CMP about two feet off the culvert bottom. Flow is determined by multiplying the velocity times the cross-sectional area of flow within the culvert. P load is determined by multiplying the flow times the P concentration of the composite sample over the period the sample was collected.

Dry Lake 49A This site is located on a 24" dia CMP on the main farm drainage ditch flowing south between Dry Lake and Milking R dairies. This site received a portion of the drainage from the Dry Lake Dairy pastures east of the milk barn. The new Dairy BAT project has prevented Dry Lake flow from reaching this station and therefore it now only receives flow from the Milking R dairy. The site is being kept because Milking R is becoming the next Dairy BAT project site. The velocity and depth sensor is installed on the upstream end and the inside of the 24" dia CMP on the culvert bottom. Flow is determined by multiplying the velocity times the cross-sectional area of flow within the culvert. P load is determined by multiplying the flow times the P concentration of the composite sample over the period the sample was collected.

Dry Lake T-In This site is located at the inlet pump station to the treatment system's retention pond. The sampler inlet sampler tube will be located in the pump's suction basin.

Flow is determined by the pump discharge curve and the suction head on the pump. The ISCO program was modified to perform this calculation. To initiate a sampling cycle a contact closure signal is provided to the ISCO sampler from the oil pressure switch on the pump motor. P load is determined by multiplying the flow times the P concentration of the composite sample over the period the sample was collected.

Dry Lake T-Mid This site is located at the gravity flow inlet structure of the alum treatment sedimentation ponds. The purpose of this midpoint monitoring is to determine how much phosphorus reduction is occurring within the retention pond before entering the alum treatment system. The velocity and depth sensor will be installed on the bottom of the 18" dia CMP inlet pipe approximately 18" upstream of the riser structure. Flow is determined by multiplying the velocity times the cross-sectional area of flow within the culvert. P load is determined by multiplying the flow times the P concentration of the composite sample over the period the sample was collected.

Dry Lake T-Out This site is located on the outlet culvert from the alum sedimentation ponds. There are two ponds which have 18" dia CMP outlet culverts that tee together before going to the farm ditch west of the ponds. The velocity and depth sensor will be installed on the downstream end and at the bottom of the 18" dia CMP out pipe approximately 18" upstream of the outlet end of pipe. Flow is determined by multiplying the velocity times the cross-sectional area of flow within the culvert. P load is determined by multiplying the flow times the P concentration of the composite sample over the period the sample was collected.

There is a single plastic perforated drain line under each of the two alum sedimentation ponds that drain directly to the perimeter ditch west of the ponds. These lines are intended to help dewater the alum floc for easier removal. These lines will represent a minor amount flow from the ponds and should have even less P losses. To verify the P content of this seepage water, quarterly grab samples will be collected at the outlet end of the drainage pipes. The flow rate will be estimated based on observed flow from the pipes and by the difference between estimated flow at T-Mid and T-Out.

Quality Assurance (QA) Program

The QA procedures for the project are provided in the QAPPs (Appendix A) and will be strictly followed. The laboratory selected for sample analyses has an approved FDEP Quality Assurance Plan.

Data Validation/Data Management, Recordkeeping and Documentation

Every monitoring station has an ISCO autosampler with a cell phone data modem which is called every night to download the velocity, depth, and subsample collection time data to SWET's computer in Gainesville. These data are reviewed weekly to determine if all sites are functioning properly. If a problem is found, then ENTEL is contacted and a maintenance trip

is scheduled to fix the problem. Velocity readings are validated as mentioned earlier by field observation by ENTEL during site visits and semi-annual zero flow calibration. Depth readings are validated by physical depth measurements performed by ENTEL during site visits.

The water quality data received from the laboratory is manually entered into an EXCEL data management spreadsheet. A second check of entered data is performed to correct possible data entry errors. Monthly, all entered water quality data and downloaded velocity and depth data are processed through the EXCEL data management spreadsheet which checks the QC samples and calculates the flow and P loads. The spreadsheet plots all the data for a visual inspection and validation. An important data management function of cleaning the very noisy velocity data is performed in a spreadsheet. The filtering process is done by developing a stage to velocity relationship using data from stable periods of record. This function is used to fill missing periods of record. During noisy periods a moving average of the maximum flow values is used because most of the noise is caused by the clean water conditions dropping signal levels to zero. This method has worked well, but an evaluation of other analysis techniques will be done during the final assessment of the data. Because the District is also using similar monitoring equipment, their staff will be consulted as to other analysis techniques. If a better analysis technique is found, then all of the data will be redone using it.

All data are maintained in the data management spreadsheet and will be provided to the District in this format and electronically in the District's ASCII comma delimited format. ENTEL maintains field notes and chain-of-custody forms for all sampling trips. Documentation of monitoring activities is provided in the quarterly report discussed in the next section.

Monitoring Progress Reports

Monitoring progress reports will be submitted to the District's Project Manager as part of the projects overall quarterly progress reports. These reports shall detail, at a minimum, the current status site installation work, problems encountered and solutions implemented, data obtained during the reporting period (farm load data as well as technology monitoring), analysis of data obtained to date, quality control issues.

Final Performance Evaluation

The final performance evaluation of the Dairy BAT edge-of-farm (EOF) treatment systems will be done by comparing the inflows to the outflows of the EOF treatment system. At each of the dairies all of the farm discharge is being diverted to the EOF treatment systems except during very large storm event where a portion of the farm runoff will have to bypass the EOF system.

As described earlier, the flow rate and TP concentration of the runoff water diverted through the EOF treatment system will be monitored at its inflow point and final outflow point. The treatment efficiency will be calculated by dividing by:

$$\text{Treatment efficient} = \frac{\text{inflow TP load- outflow TP load}}{\text{inflow TP load.}}$$

During non bypass conditions, this treatment efficiency represents the treatment efficiency for the entire farm discharge. However, during bypass conditions, the treatment efficiency for the entire farm discharge will be calculated by:

$$\text{Farm Treatment efficient} = \frac{\text{inflow TP load- outflow TP load}}{\text{inflow TP load + bypass TP load}}$$

The bypass TP load is given by:

$$\text{Bypass TP load} = \text{inflow TP concentrations} \times \text{bypass flow rate.}$$

Note that the inflow TP concentration for the bypass water is the same as that entering the EOF system. The bypass flow can be calculated using weir equations for the bypass structures and water depth over the structures. Because the upstream water level for both the bypass structures and the treatment inflow structure, inflow monitoring station's depth reading from the ISCO will provide the appropriate head data for calculating flow at both structures.

As previously noted the non treatment monitoring sites are due to terminate as of May 2004. However, based on availability of budget, the following sites will be maintained past this date: Butler 41A, Davie South, and Dry Lake 32B and 49A.

APPENDIX A. Draft Quality Assurance Project Plans (QAPPs)

The QAPPs are presented in the following order:

Butler Oaks Dairy
Davie Dairy, Inc.
Dry Lake Dairy

Section 1.0 **TITLE AND DEP APPROVAL PAGE**

Dairy Best Available Technologies in the Okeechobee Basin
Butler Oaks Dairy

South Florida Water Management District
Contract No. C-11652

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QUALITY ASSURANCE ELEMENTS

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Section 3.0 **PROJECT DESCRIPTION**

3.1 Site Identification and History

Site Name: Butler Oaks Dairy

Site Address: 172 Shady Oaks Lane
Lorida, FL 33857

3.1.1 Site History

The sites are located at identified major inflow and outflow points on the dairy, plus the inflow and outflow of the new edge-of-farm treatment system that is being constructed to treat the drainage from the dairy. The treatment system is located just south of the existing large waste storage pond located on the southeastern part of the dairy property.

3.1.2 Summary of the Historical Data – See Table 3.1, data only available for input to system which is assumed to be similar to the data collected at existing station 41A and 41B.

3.2 Project Scope and Purpose

3.2.1 Purpose of this Project

The overall purpose of this study is to identify, select, monitor and oversee implementation of Best Available Technologies (BATs) that will significantly reduce the export of phosphorus (P) from dairy operations into tributaries and Lake Okeechobee. Various alternatives were evaluated and it was determined that a chemical treatment system for edge-of-farm stormwater flow was the most cost effective technology to be implemented on the dairy. The system includes stormwater diversion and retention/detention, alum injection system, floc settling ponds, and sludge recovery areas. The goal of this project will be to evaluate the success of the treatment technologies, the effluent inflow and outflow for the technologies, will be monitored continuously for flow rate and have flow-proportional sampling to determine total phosphorus reduction and coliform bacteria presence.

3.2.2 Intended end use of the data:

_____ Permit Compliance
__x__ Feasibility Study
_____ Consent Order Compliance
_____ Remedial Action
_____ Contamination Assessment
__x__ Water Quality Data Base (Specify which Data Base:
SFWMD Water Quality Database)
_____ Facility Operating Report
_____ Other: _____

3.2.3 Projected Schedule and Scope of Work

November 2000
Projected Beginning Date

October 2005
Projected Ending Date

Major Project Tasks

Specific Project Activity		Scheduled Date
1	Draft goals, potential impacts/performance measures & draft evaluation method outline	November 2000
2	Literature search	January 2001
3	Final goals, potential impacts/performance measures & draft evaluation method outline	March 2001
4	Dairy ranking and summary	March 2001
5	Landowner agreements	November 2001
6	Draft Quality Assurance Project Plan (QAPP) and monitoring plans	June 2001
7	Draft alternatives	June 2001
8	Final QAPP and monitoring plans	August 2001
9	Final technology alternatives and final report	August 2001
10	Draft evaluation report of evaluation of alternatives	September 2001
11	Draft Comprehensive Nutrient Management Plans (CNMPs) for three selected diaries	October 2001
12	Stakeholder meeting	October 2001
13	Evaluation of alternatives final report	November 2001
14	Final CNMPs report for the three selected diaries	February 2002
15	Governing Board presentation	February 2002
16	Install/test monitoring stations	April 2002
17	Routine field monitoring activities (52 biweekly trips)	April 2002
18	Laboratory analysis (9 biweekly samples for 52 trips)	April 2002
19	Laboratory analysis (9 monthly sample for 24 months)	April 2002
20	Quarterly reports	April 2002
21	Draft vendor project documents (bid specifications & agreements)	March 2002

Major Project Tasks (Con't)

	Specific Project Activity	Scheduled Date
22	Final vendor project documents (bid specifications & agreements)	June 2002
23	Draft implementation plan for selected technologies	July 2002
24	Draft monitoring plan for selected technologies (current activity)	May 2003
25	Final implementation plan for selected technologies	March 2003
26	Final monitoring plan for selected technologies	Nov 2003
27	Routine monitoring activities (34 biweekly trips)	Dec 2003
28	Laboratory analysis (34 weekly trips)	Dec 2003
29	Bi-annual site meetings (6 meetings total, 2 per site)	June 2003
30	Public workshop	April 2004
31	Prepare and Submit Project Draft Final Report	January 2005
32	Public workshop	October 2005
33	Evaluation of Alternative Performance	October 2005
34	Submit Final Project Data and Report	October 2005

TABLE 3.1
Summary of Historical Data

	Parameter	Concentration range (units)
1.	TP	0.2 to 3 mg/l
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

TABLE 3.2

PROPOSED SAMPLES, MATRICES AND ANALYTICAL METHODS FOR THE PROJECT

The standards criteria outlined in DEP Rule 17-302 are the detection limit criteria for this project. **The detection limits reported for this project shall at least meet, or be lower than the stated standards.**

FIELD MEASUREMENTS WILL BE PERFORMED BY: ENTEL Environmental Companies, Inc. whose CompQAP # is 930121 with annual amendments approved on 10-15-03.

PARAMETER	**METHOD #**
Not Applicable	

FIELD SAMPLE COLLECTION ACTIVITIES WILL BE PERFORMED BY THE ABOVE NAMED ORGANIZATION.

LABORATORY ANALYSES WILL BE PERFORMED BY: Severn Trent Services, FDEP CompQAP# 990102.

				QUALITY CONTROL SUMMARY					QA TARGETS*		
FREQUENCY	**SAMPLE MATRIX**	**SAMPLE SOURCE**	**# SAMPLES**	**TB**	**EB**	**FD**	**ANALYTICAL METHOD #**	**COMPONENT**	**P**	**A**	**MDL**
Bi-Weekly	Water	Surface Water	15	0	2	2	SM 4500-PF	Total P	5%	10%	0.01 mg/l
Monthly	Water	Surface Water	15	0	2	2	EPA 160.2	Total TSS	5%	10%	1.0 mg/l
Monthly	Water	Surface Water	15	0	2	2	SM 9222D	Fecal Coliform	5%	10%	1.0 CFU/100ml

TB - Trip Blank
EB - Equipment Blank
FD - Field duplicate
P - Precision
A - Accuracy
MDL - Method Detection Limit

*These values need to be completed if the Data Quality Objectives stated in the project description are different from the routine QA objectives cited in the CompQAP(s) or are not included in the CompQAP(s).

DEP Form 62-160.900(1) (Revised 1-92)

3.3 Project Organization

3.3.1 Project Organization – Sample collection activities will be conducted by ENTEL Environmental Companies, Inc. (ENTEL) with assistance from Soil & Water Engineering Technologies (SWET) on an as needed basis. The Laboratory analytical work will be performed by Severn Trent Services, 10200 USA Today Way, Miramar, FL 33025

Refer to Figure 3.1, "Project Organization" for specific organization of this project.

3.3.2 Personnel Modifications or Additions – The following personnel are not included in the CompQAPs of the referenced organizations (include brief description of project responsibilities);

A. Field Personnel
   1. None
   2.

B. Laboratory Personnel
   1. None
   2.

3.4 Project Objectives

3.4.1 Data Quality Objectives

__X__ The data quality objectives for this project are the routine QA targets listed in the laboratory CompQAP.

_____ The minimum detection limits to be achieved for this study differ from the routine detection limits specified in the laboratory CompQAP and are included as a part of Table 3.2.

_____ The precision and accuracy requirements differ from the routine targets specified in the laboratory CompQAP and are included as a part of Table 3.2.

3.4.2 Proposed samples for project
   a. See Figure 3.2 for a map of the project site.
   b. See Table 3.2 of this Section for a summary of the sampling and analyses activities.

3.4.3 Summary of Matrix Types, Analytical Methods and QA Targets

Field and laboratory analytical measurements are presented in Table 3.2.

Figure 3.1

Project Organization

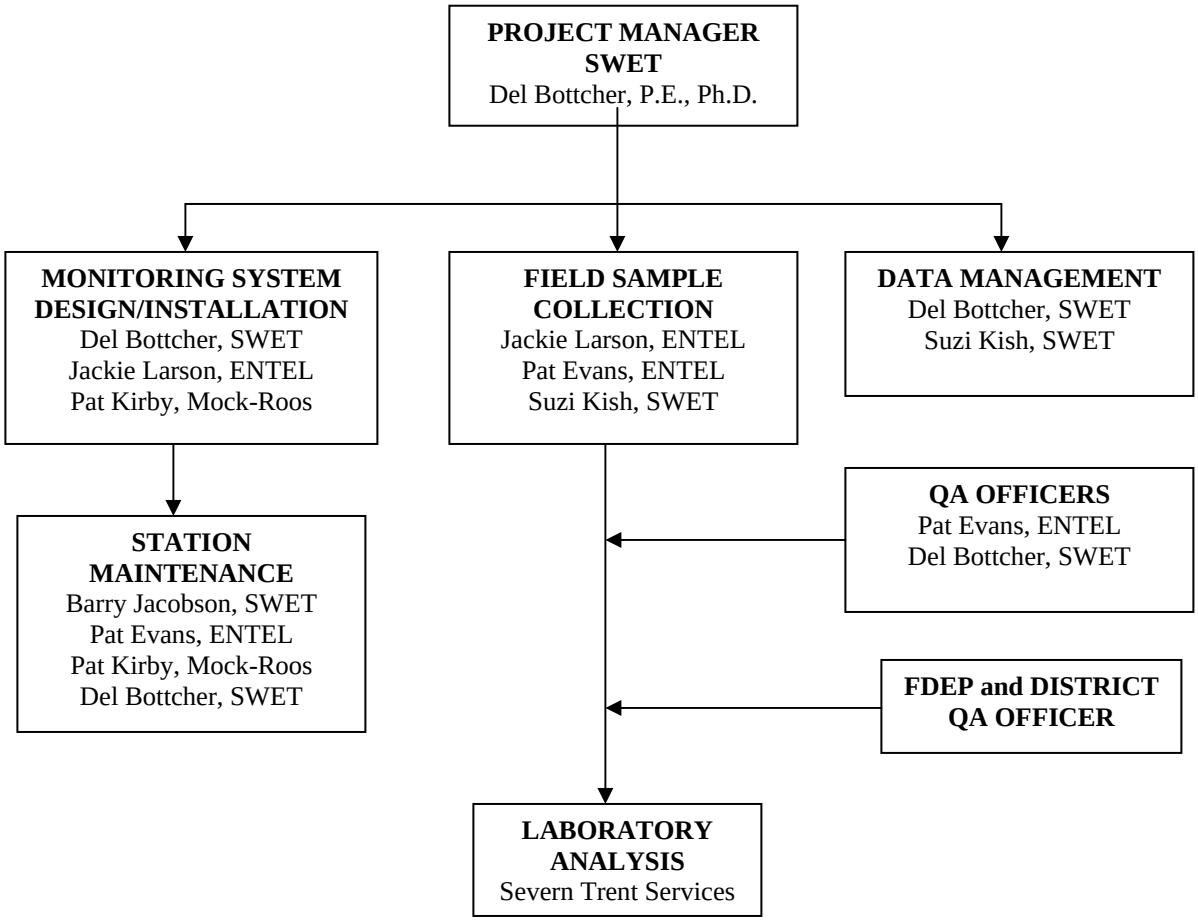
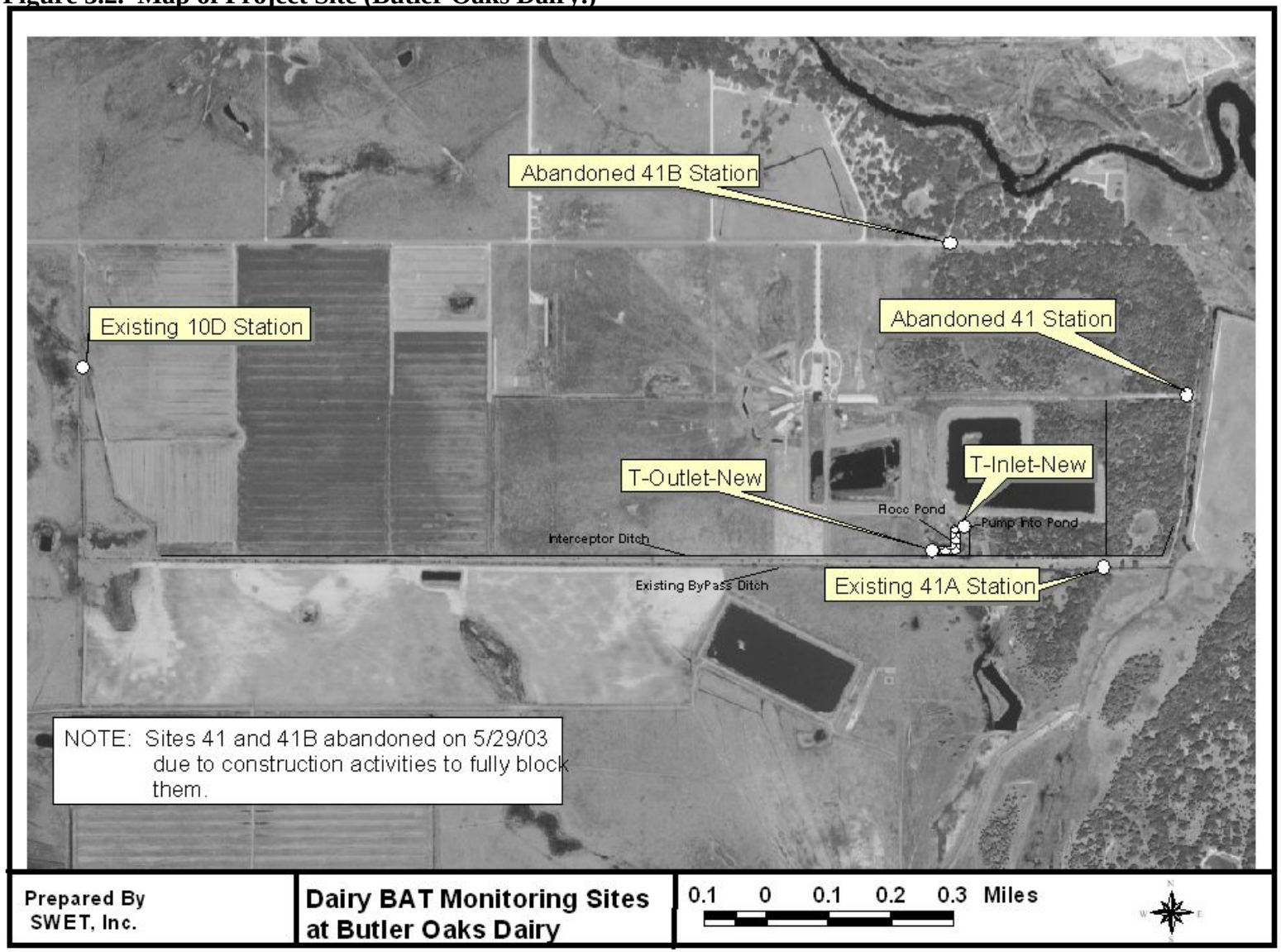


Figure 3.2. Map of Project Site (Butler Oaks Dairy.)



Section 4.0 **FIELD PROCEDURES AND QUALITY CONTROL**

This section specifies the protocols and procedures to be used by ENTEL Environmental Companies, Inc. (ENTEL) with assistance from Soil & Water Engineering Technologies (SWET) when conducting sampling activities for this project.

4.1 Sampling Equipment

See Table 4.1 for a list of the equipment to be used for this project.

4.2 **Field Activities** – See Table 4.2

4.2.1 Sampling protocols for this project that are not specified by the CompQAP specified in Table 4.2 include the following

1. A 24-hour holding time wavier was authorization in writing by SFWMD & FDEP for Fecal Coliform
2.
3.

4.2.2 Disposal protocols for handling wastes differ from those specified by the CompQAP. Wastes will be handled according to the following protocols:

1. (not applicable)
2.
3.

4.3 Field Measurements

Field measurements are listed in Table 3.2 of this QAPP. Field screening measurements that will be made are:

1.
2.
3.

TABLE 4.1

PROPOSED SAMPLING EQUIPMENT

The following equipment will be used ENTEL Environmental Companies, Inc. for this project. With the exception of the additional equipment, discussions on use and restrictions are included in CompQAP # 930121 with annual amendments approved on 10-15-03.

EQUIPMENT DESCRIPTION	CONSTRUCTION MATERIALS	USE
Purging Equipment (include construction of tubing, tail pipes, etc.)		
1. None		
2.		
3.		
4.		
5.		
Sampling Equipment		
1. Sample Bottles Provided by Laboratory	Plastic (Inorganic anions and TSS)	
2. ISCO Model 6712 Compostie Autosampler	Tygon tubing, polyproplylene bottle	
3. whril-pac bag	Plastic (for fecal samples)	
4.		
5.		
6.		
7.		

Additional equipment not addressed in the CompQAP includes[1]:

1. Teflon Dip Rod
2.
3.
4.

[1]If the sampling protocols for using this equipment are not included in the cited CompQAP, the sampling protocols must be discussed in Section 4.2.1 of this Quality Assurance Project Plan.

Field Measurement Equipment (construction does not need to be specified)

1.
2.
3.
4.
5.

DEP Form 62-160.900(1) (Revised 1-92)

TABLE 4.2
FIELD ACTIVITIES

The following field protocols will be used by ENTEL Environmental Companies, Inc.

The Comprehensive QA Plan number for this organization is 930121 with last annual amendments

approved on 10-15-00.

All protocols, procedures and policies in the above-mentioned document which are pertinent to this Quality Assurance Project Plan will be followed and are summarized below:

	VOCs	Extr. Org.	Metals	Inorg. Anions	Org.	Phys. Prop.	Micro	Other (Specify)
Groundwater								
Groundwater (in-place plumbi								
Potable Water								
Surface Water				X		X		X (Fecal Coliform)
Soil								
Sediment/Sludges								
Automatic Samplers								
Field Filtration								
Wastewater				X		X		X (Fecal Coliform)
Stormwater runoff				X		X		X (Fecal Coliform)

SAMPLE CONTAINERS

Sample containers will be supplied by: Severn Trent Services, 10200 USA Today Way, Miramar, FL 33025, FDEP CompQAP# 990102

X Sample containers will be prepreserved by the above-referenced organization and additional acid will be provided; **OR**
X Field organizations will preserve samples on site using protocols outlined in the CompQAP.

EQUIPMENT DECONTAMINATION

Equipment decontamination will follow protocols outlined in the above-referenced CompQAP.*

EQUIPMENT SHALL BE PRECLEANED PRIOR TO ON-SITE ARRIVAL

* **If more than one organization is involved with these activities, this QAPP must specifically identify the equipment and/or sample containers to be provided by each organization.**

WASTE DISPOSAL

X The procedures for handling wastes from equipment cleaning and from sampling are discussed in the above-referenced CompQAP.
___The disposal procedures for handling wastes for this project differ from those outlined in the above referenced CompQAP and are outlined in Section 4.2.2.

DEP Form 62-160.900(1) (Revised 1-92)

5.0 LABORATORY PROCEDURES AND QUALITY CONTROL

The laboratory analysis shall be conducted by Severn Trent Services, 10200 USA Today Way, Miramar, FL 33025. The Comprehensive QA Plan numbers for these organizations are FDEP CompQAP# 990102. The date of the last update approval is 2003.

All protocols, procedures and policies in the above-mentioned document, which are pertinent to this Quality Assurance Project Plan, shall be followed. The laboratory shall analyze the samples for this project by the methods specified in Table 3.2 of the QAPP.

5.1 Quality Control Checks

The types of laboratory control checks that will be used when analyzing samples for this project are:

Chemical:

_____ Reagent Blanks
_____ Duplicate Samples
_____ Duplicate Matrix Spikes
_____ Continuing Calibration Standards
_____ Other: _____
_____
_____ Matrix Spikes
_____ QC Check Samples
_____ QC Check Standards

Microbiology:

_____ Duplicates
_____ Carry-over Blanks (MF)
_____ Positive & Negative Controls
_____ Other: _____
_____
_____ Control Blanks (MF)
_____ Dilution Blanks (MPN)

6.0 QUALITY ASSURANCE MANAGEMENT

6.1 Corrective Actions

In addition to corrective actions cited in the approved CompQAP, **ALL INVOLVED PARTIES WILL INITIATE ANY CORRECTIVE ACTION DEEMED NECESSARY BY DEP.**

6.2 Performance and System Audits

6.2.1 Field Activities

Specific audits planned for this project are:

Audit Type Description	Frequency/Date
1. None	
2.	
3.	

6.2.2 Laboratory Activities

Specific audits planned for this project are:

Audit Type Description	Frequency/Date
1. None	
2.	
3.	

ALL INVOLVED PARTIES WILL CONSENT TO AUDITS BY DEP IF DEEMED NECESSARY.

6.3 Quality Assurance Reports

Project specific QA reports will be submitted to Jim Laing, Project Manager, SFWMD at a frequency of Quarterly.

Note: Frequency must comply with Table IV, Appendix D of the DEP Manual for Preparing Quality Assurance Plans or Table 6 of Chapter 62-160, F.A.C., Quality Assurance.

Section 1.0 **TITLE AND DEP APPROVAL PAGE**

Dairy Best Available Technologies in the Okeechobee Basin
Davie Dairy

South Florida Water Management District
Contract No. C-11652

Prepared by:

ENTEL Environmental Companies, Inc.
270 Las Palmas Street
Royal Palm Beach, FL 33411-1323
(561) 798-3785

Del B. Bottcher, President & QA Officer, SWET	(Date)
Jacqulyn Larson, President, ENTEL	(Date)
Patrick Evans, QA Officer, ENTEL	(Date)
Jim Laing, Project Manager, SFWMD	(Date)
Ruth McKinley, Severn Trent Services (Laboratory)	(Date)
LAB	(Date)
LAB	(Date)
LAB	(Date)

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QUALITY ASSURANCE ELEMENTS

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Section 3.0 **PROJECT DESCRIPTION**

3.1 Site Identification and History

Site Name: Davie Dairy Inc.

Site Address: 3105 NE 128th Ave.
Okeechobee, FL 34974

3.1.1 Site History

The sites are located at identified major inflow and outflow points on the dairy, plus the inflow and outflow of the new edge-of-farm treatment system that is being constructed to treat the drainage from the dairy. The system is located just to the east of Nubbin Slough before it leaves the dairy property.

3.1.2 Summary of the Historical Data – See Table 3.1, data only available for input to system which is assumed to be similar to the data collected within Nubbin Slough.

3.2 Project Scope and Purpose

3.2.1 Purpose of this Project

The overall purpose of this study is to identify, select, monitor and oversee implementation of Best Available Technologies (BATs) that will significantly reduce the export of phosphorus (P) from dairy operations into tributaries and Lake Okeechobee. Various alternatives were evaluated and it was determined that a chemical treatment system for edge-of-farm stormwater flow was the most cost effective technology to be implemented on the dairy. The system includes stormwater diversion and retention/detention, alum injection system, floc settling ponds, and sludge recovery areas. The goal of this project will be to evaluate the success of the treatment technologies, the effluent inflow and outflow for the technologies, will be monitored continuously for flow rate and have flow-proportional sampling to determine total phosphorus reduction and coliform bacteria presence.

3.2.2 Intended end use of the data:

_____ Permit Compliance
__x__ Feasibility Study
_____ Consent Order Compliance
_____ Remedial Action
_____ Contamination Assessment
__x__ Water Quality Data Base (Specify which Data Base:
SFWMD Water Quality Database)
_____ Facility Operating Report
_____ Other: _____

3.2.3 Projected Schedule and Scope of Work

November 2000
Projected Beginning Date

October 2005
Projected Ending Date

Major Project Tasks

	Specific Project Activity	Scheduled Date
1	Draft goals, potential impacts/performance measures & draft evaluation method outline	November 2000
2	Literature search	January 2001
3	Final goals, potential impacts/performance measures & draft evaluation method outline	March 2001
4	Dairy ranking and summary	March 2001
5	Landowner agreements	November 2001
6	Draft Quality Assurance Project Plan (QAPP) and monitoring plans	June 2001
7	Draft alternatives	June 2001
8	Final QAPP and monitoring plans	August 2001
9	Final technology alternatives and final report	August 2001
10	Draft evaluation report of evaluation of alternatives	September 2001
11	Draft Comprehensive Nutrient Management Plans (CNMPs) for three selected diaries	October 2001
12	Stakeholder meeting	October 2001
13	Evaluation of alternatives final report	November 2001
14	Final CNMPs report for the three selected diaries	February 2002
15	Governing Board presentation	February 2002
16	Install/test monitoring stations	April 2002
17	Routine field monitoring activities (52 biweekly trips)	April 2002
18	Laboratory analysis (9 biweekly samples for 52 trips)	April 2002
19	Laboratory analysis (9 monthly sample for 24 months)	April 2002
20	Quarterly reports	April 2002
21	Draft vendor project documents (bid specifications & agreements)	March 2002

Major Project Tasks (Con't)

	Specific Project Activity	Scheduled Date
22	Final vendor project documents (bid specifications & agreements)	June 2002
23	Draft implementation plan for selected technologies	July 2002
24	Draft monitoring plan for selected technologies (current activity)	May 2003
25	Final implementation plan for selected technologies	March 2003
26	Final monitoring plan for selected technologies	Nov 2003
27	Routine monitoring activities (34 biweekly trips)	Dec 2003
28	Laboratory analysis (34 weekly trips)	Dec 2003
29	Bi-annual site meetings (6 meetings total, 2 per site)	June 2003
30	Public workshop	April 2004
31	Prepare and Submit Project Draft Final Report	January 2005
32	Public workshop	October 2005
33	Evaluation of Alternative Performance	October 2005
34	Submit Final Project Data and Report	October 2005

TABLE 3.1
Summary of Historical Data

	Parameter	Concentration range (units)
1.	TP	0.2 to 3 mg/l
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

TABLE 3.2

PROPOSED SAMPLES, MATRICES AND ANALYTICAL METHODS FOR THE PROJECT

The standards criteria outlined in DEP Rule 17-302 are the detection limit criteria for this project. **The detection limits reported for this project shall at least meet, or be lower than the stated standards.**

FIELD MEASUREMENTS WILL BE PERFORMED BY: ENTEL Environmental Companies, Inc. whose CompQAP # is 930121 with annual amendments approved on 10-15-03.

PARAMETER	**METHOD #**
Not Applicable	

FIELD SAMPLE COLLECTION ACTIVITIES WILL BE PERFORMED BY THE ABOVE NAMED ORGANIZATION.

LABORATORY ANALYSES WILL BE PERFORMED BY: Severn Trent Services, FDEP CompQAP# 990102.

				QUALITY CONTROL SUMMARY					QA TARGETS*		
FREQUENCY	**SAMPLE MATRIX**	**SAMPLE SOURCE**	**# SAMPLES**	**TB**	**EB**	**FD**	**ANALYTICAL METHOD #**	**COMPONENT**	**P**	**A**	**MDL**
Bi-Weekly	Water	Surface Water	15	0	2	2	SM 4500-PF	Total P	5%	10%	0.01 mg/l
Monthly	Water	Surface Water	15	0	2	2	EPA 160.2	Total TSS	5%	10%	1.0 mg/l
Monthly	Water	Surface Water	15	0	2	2	SM 9222D	Fecal Coliform	5%	10%	1.0 CFU/100ml

TB - Trip Blank
EB - Equipment Blank
FD - Field duplicate
P - Precision
A - Accuracy
MDL - Method Detection Limit

*These values need to be completed if the Data Quality Objectives stated in the project description are different from the routine QA objectives cited in the CompQAP(s) or are not included in the CompQAP(s).

DEP Form 62-160.900(1) (Revised 1-92)

3.3 Project Organization

3.3.1 Project Organization – Sample collection activities will be conducted by ENTEL Environmental Companies, Inc. (ENTEL) with assistance from Soil & Water Engineering Technologies (SWET) on an as needed basis. The Laboratory analytical work will be performed by Severn Trent Services, 10200 USA Today Way, Miramar, FL 33025

Refer to Figure 3.1, "Project Organization" for specific organization of this project.

3.3.2 Personnel Modifications or Additions – The following personnel are not included in the CompQAPs of the referenced organizations (include brief description of project responsibilities);

A. Field Personnel
   1. None
   2.

B. Laboratory Personnel
   1. None
   2.

3.4 Project Objectives

3.4.1 Data Quality Objectives

__X__ The data quality objectives for this project are the routine QA targets listed in the laboratory CompQAP.

_____ The minimum detection limits to be achieved for this study differ from the routine detection limits specified in the laboratory CompQAP and are included as a part of Table 3.2.

_____ The precision and accuracy requirements differ from the routine targets specified in the laboratory CompQAP and are included as a part of Table 3.2.

3.4.2 Proposed samples for project
   a. See Figure 3.2 for a map of the project site.
   b. See Table 3.2 of this Section for a summary of the sampling and analyses activities.

3.4.3 Summary of Matrix Types, Analytical Methods and QA Targets

Field and laboratory analytical measurements are presented in Table 3.2.

Figure 3.1

Project Organization

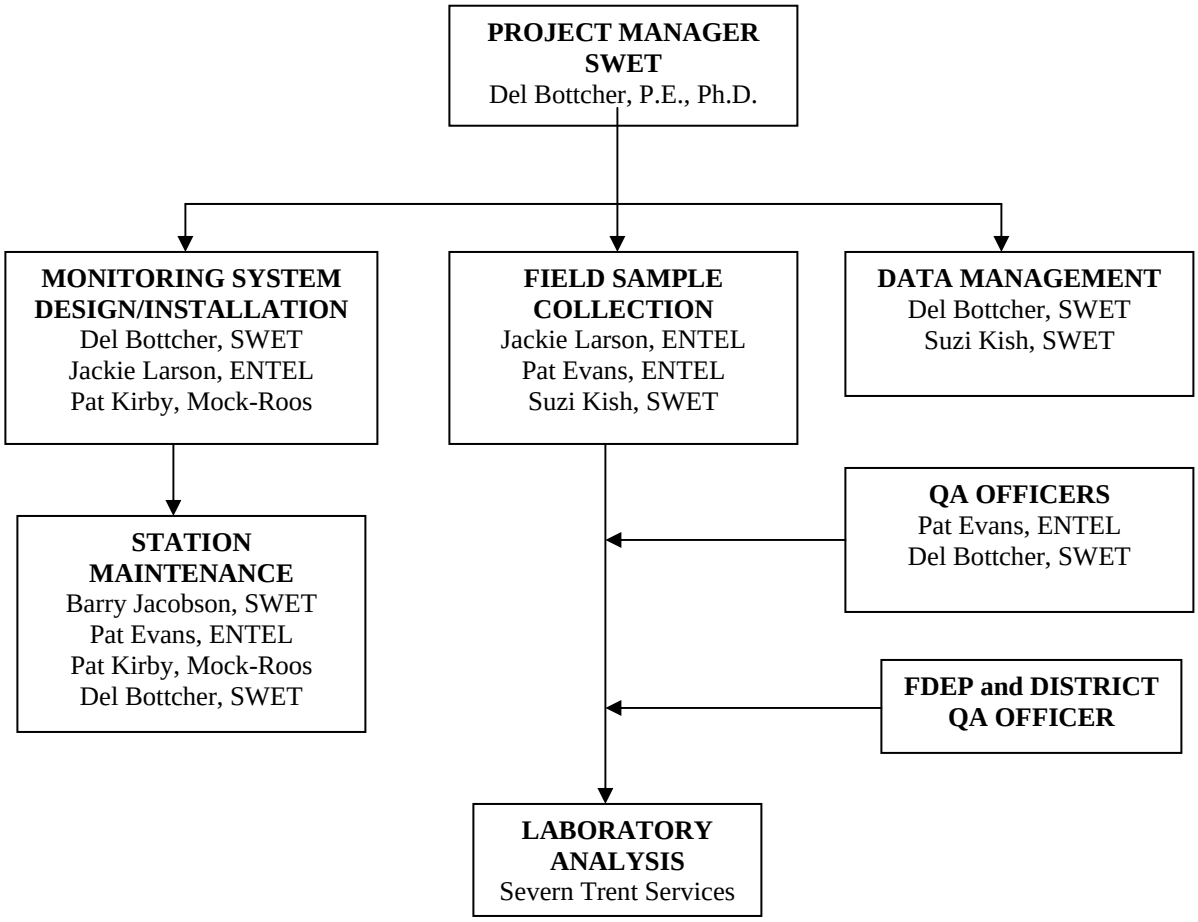
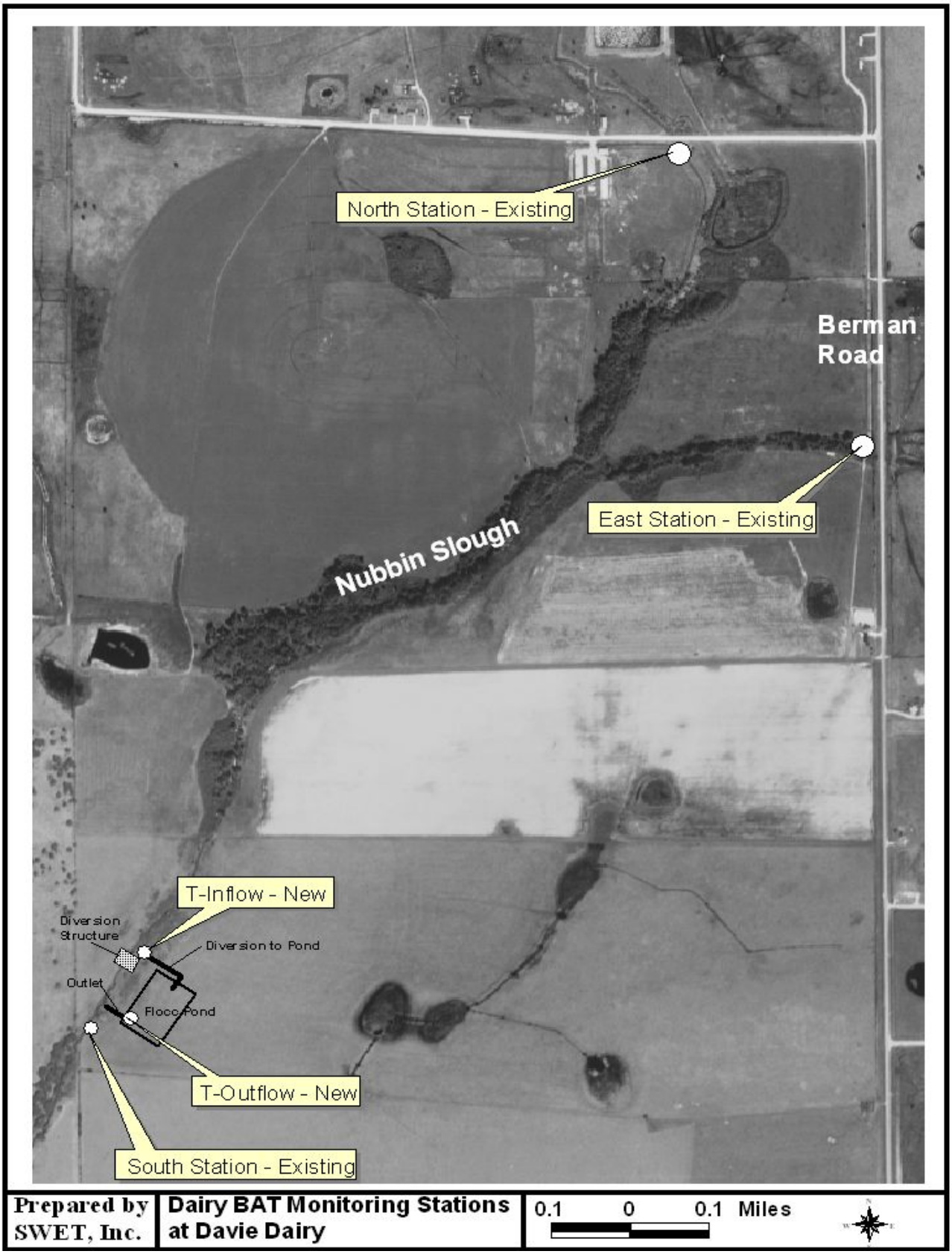


Figure 3.2. Map of Project Site (Davie Dairy Inc.)



Section 4.0 **FIELD PROCEDURES AND QUALITY CONTROL**

This section specifies the protocols and procedures to be used by ENTEL Environmental Companies, Inc. (ENTEL) with assistance from Soil & Water Engineering Technologies (SWET) when conducting sampling activities for this project.

4.1 Sampling Equipment

See Table 4.1 for a list of the equipment to be used for this project.

4.2 **Field Activities** – See Table 4.2

4.2.1 Sampling protocols for this project that are not specified by the CompQAP specified in Table 4.2 include the following

1. A 24-hour holding time wavier was authorization in writing by SFWMD & FDEP for Fecal Coliform
2.
3.

4.2.2 Disposal protocols for handling wastes differ from those specified by the CompQAP. Wastes will be handled according to the following protocols:

1. (not applicable)
2.
3.

4.3 Field Measurements

Field measurements are listed in Table 3.2 of this QAPP. Field screening measurements that will be made are:

1.
2.
3.

TABLE 4.1

PROPOSED SAMPLING EQUIPMENT

The following equipment will be used ENTEL Environmental Companies, Inc. for this project. With the exception of the additional equipment, discussions on use and restrictions are included in CompQAP # 930121 with annual amendments approved on 10-15-03.

EQUIPMENT DESCRIPTION	CONSTRUCTION MATERIALS	USE
Purging Equipment (include construction of tubing, tail pipes, etc.)		
1. None		
2.		
3.		
4.		
5.		
Sampling Equipment		
1. Sample Bottles Provided by Laboratory	Plastic (Inorganic anions and TSS)	
2. ISCO Model 6712 Compostie Autosampler	Tygon tubing, polyproplylene bottle	
3. whril-pac bag	Plastic (for fecal samples)	
4.		
5.		
6.		
7.		

Additional equipment not addressed in the CompQAP includes[1]:

1. Teflon Dip Rod
2.
3.
4.

[1]If the sampling protocols for using this equipment are not included in the cited CompQAP, the sampling protocols must be discussed in Section 4.2.1 of this Quality Assurance Project Plan.

Field Measurement Equipment (construction does not need to be specified)

1.
2.
3.
4.
5.

DEP Form 62-160.900(1) (Revised 1-92)

TABLE 4.2
FIELD ACTIVITIES

The following field protocols will be used by ENTEL Environmental Companies, Inc.

The Comprehensive QA Plan number for this organization is 930121 with last annual amendments

approved on 10-15-00.

All protocols, procedures and policies in the above-mentioned document which are pertinent to this Quality Assurance Project Plan will be followed and are summarized below:

	VOCs	Extr. Org.	Metals	Inorg. Anions	Org.	Phys. Prop.	Micro	Other (Specify)
Groundwater								
Groundwater (in-place plumbi								
Potable Water								
Surface Water				X		X		X (Fecal Coliform)
Soil								
Sediment/Sludges								
Automatic Samplers								
Field Filtration								
Wastewater				X		X		X (Fecal Coliform)
Stormwater runoff				X		X		X (Fecal Coliform)

SAMPLE CONTAINERS

Sample containers will be supplied by: Severn Trent Services, 10200 USA Today Way, Miramar, FL 33025, FDEP CompQAP# 990102

X Sample containers will be prepreserved by the above-referenced organization and additional acid will be provided; **OR**
X Field organizations will preserve samples on site using protocols outlined in the CompQAP.

EQUIPMENT DECONTAMINATION

Equipment decontamination will follow protocols outlined in the above-referenced CompQAP.*

EQUIPMENT SHALL BE PRECLEANED PRIOR TO ON-SITE ARRIVAL

* **If more than one organization is involved with these activities, this QAPP must specifically identify the equipment and/or sample containers to be provided by each organization.**

WASTE DISPOSAL

X The procedures for handling wastes from equipment cleaning and from sampling are discussed in the above-referenced CompQAP.
___The disposal procedures for handling wastes for this project differ from those outlined in the above referenced CompQAP and are outlined in Section 4.2.2.

DEP Form 62-160.900(1) (Revised 1-92)

5.0 LABORATORY PROCEDURES AND QUALITY CONTROL

The laboratory analysis shall be conducted by Severn Trent Services, 10200 USA Today Way, Miramar, FL 33025. The Comprehensive QA Plan numbers for these organizations are FDEP CompQAP# 990102. The date of the last update approval is 2003.

All protocols, procedures and policies in the above-mentioned document, which are pertinent to this Quality Assurance Project Plan, shall be followed. The laboratory shall analyze the samples for this project by the methods specified in Table 3.2 of the QAPP.

5.1 Quality Control Checks

The types of laboratory control checks that will be used when analyzing samples for this project are:

Chemical:

_____ Reagent Blanks
_____ Duplicate Samples
_____ Duplicate Matrix Spikes
_____ Continuing Calibration Standards
_____ Other: _____
_____
_____ Matrix Spikes
_____ QC Check Samples
_____ QC Check Standards

Microbiology:

_____ Duplicates
_____ Carry-over Blanks (MF)
_____ Positive & Negative Controls
_____ Other: _____
_____
_____ Control Blanks (MF)
_____ Dilution Blanks (MPN)

6.0 QUALITY ASSURANCE MANAGEMENT

6.1 Corrective Actions

In addition to corrective actions cited in the approved CompQAP, **ALL INVOLVED PARTIES WILL INITIATE ANY CORRECTIVE ACTION DEEMED NECESSARY BY DEP.**

6.2 Performance and System Audits

6.2.1 Field Activities

Specific audits planned for this project are:

Audit Type Description	Frequency/Date
1. None	
2.	
3.	

6.2.2 Laboratory Activities

Specific audits planned for this project are:

Audit Type Description	Frequency/Date
1. None	
2.	
3.	

ALL INVOLVED PARTIES WILL CONSENT TO AUDITS BY DEP IF DEEMED NECESSARY.

6.3 Quality Assurance Reports

Project specific QA reports will be submitted to Jim Laing, Project Manager, SFWMD at a frequency of Quarterly.

Note: Frequency must comply with Table IV, Appendix D of the DEP Manual for Preparing Quality Assurance Plans or Table 6 of Chapter 62-160, F.A.C., Quality Assurance.

Section 1.0 **TITLE AND DEP APPROVAL PAGE**

Dairy Best Available Technologies in the Okeechobee Basin
Dry Lake Dairy

South Florida Water Management District
Contract No. C-11652

Prepared by:

ENTEL Environmental Companies, Inc.
270 Las Palmas Street
Royal Palm Beach, FL 33411-1323
(561) 798-3785

Del B. Bottcher, President & QA Officer, SWET	(Date)
Jacqulyn Larson, President, ENTEL	(Date)
Patrick Evans, QA Officer, ENTEL	(Date)
Jim Laing, Project Manager, SFWMD	(Date)
Ruth McKinley, Severn Trent Services (Laboratory)	(Date)
LAB	(Date)
LAB	(Date)
LAB	(Date)

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Section 3.0 **PROJECT DESCRIPTION**

3.1 Site Identification and History

Site Name: Dry Lake Dairy

Site Address: 6908 Highway 98 North
Okeechobee, FL 34972

3.1.1 Site History

The sites are located at identified major inflow and outflow points on the dairy, plus the inflow and outflow of the new edge-of-farm treatment system that is being constructed to treat the drainage from the dairy. The treatment system is located in the southwestern part of the dairy property.

3.1.2 Summary of the Historical Data – See Table 3.1, data only available for input to system which is assumed to be similar to the data collected at existing station 32B.

3.2 Project Scope and Purpose

3.2.1 Purpose of this Project

The overall purpose of this study is to identify, select, monitor and oversee implementation of Best Available Technologies (BATs) that will significantly reduce the export of phosphorus (P) from dairy operations into tributaries and Lake Okeechobee. Various alternatives were evaluated and it was determined that a chemical treatment system for edge-of-farm stormwater flow was the most cost effective technology to be implemented on the dairy. The system includes stormwater diversion and retention/detention, alum injection system, floc settling ponds, and sludge recovery areas. The goal of this project will be to evaluate the success of the treatment technologies, the effluent inflow and outflow for the technologies, will be monitored continuously for flow rate and have flow-proportional sampling to determine total phosphorus reduction and coliform bacteria presence.

3.2.2 Intended end use of the data:

_____ Permit Compliance
__x__ Feasibility Study
_____ Consent Order Compliance
_____ Remedial Action
_____ Contamination Assessment
__x__ Water Quality Data Base (Specify which Data Base:
SFWMD Water Quality Database)
_____ Facility Operating Report
_____ Other: _____

3.2.3 Projected Schedule and Scope of Work

November 2000
Projected Beginning Date

October 2005
Projected Ending Date

Major Project Tasks

	Specific Project Activity	Scheduled Date
1	Draft goals, potential impacts/performance measures & draft evaluation method outline	November 2000
2	Literature search	January 2001
3	Final goals, potential impacts/performance measures & draft evaluation method outline	March 2001
4	Dairy ranking and summary	March 2001
5	Landowner agreements	November 2001
6	Draft Quality Assurance Project Plan (QAPP) and monitoring plans	June 2001
7	Draft alternatives	June 2001
8	Final QAPP and monitoring plans	August 2001
9	Final technology alternatives and final report	August 2001
10	Draft evaluation report of evaluation of alternatives	September 2001
11	Draft Comprehensive Nutrient Management Plans (CNMPs) for three selected diaries	October 2001
12	Stakeholder meeting	October 2001
13	Evaluation of alternatives final report	November 2001
14	Final CNMPs report for the three selected diaries	February 2002
15	Governing Board presentation	February 2002
16	Install/test monitoring stations	April 2002
17	Routine field monitoring activities (52 biweekly trips)	April 2002
18	Laboratory analysis (9 biweekly samples for 52 trips)	April 2002
19	Laboratory analysis (9 monthly sample for 24 months)	April 2002
20	Quarterly reports	April 2002
21	Draft vendor project documents (bid specifications & agreements)	March 2002

Major Project Tasks (Con't)

	Specific Project Activity	Scheduled Date
22	Final vendor project documents (bid specifications & agreements)	June 2002
23	Draft implementation plan for selected technologies	July 2002
24	Draft monitoring plan for selected technologies (current activity)	May 2003
25	Final implementation plan for selected technologies	March 2003
26	Final monitoring plan for selected technologies	Nov 2003
27	Routine monitoring activities (34 biweekly trips)	Dec 2003
28	Laboratory analysis (34 weekly trips)	Dec 2003
29	Bi-annual site meetings (6 meetings total, 2 per site)	June 2003
30	Public workshop	April 2004
31	Prepare and Submit Project Draft Final Report	January 2005
32	Public workshop	October 2005
33	Evaluation of Alternative Performance	October 2005
34	Submit Final Project Data and Report	October 2005

TABLE 3.1
Summary of Historical Data

	Parameter	Concentration range (units)
1.	TP	0.2 to 3 mg/l
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

TABLE 3.2

PROPOSED SAMPLES, MATRICES AND ANALYTICAL METHODS FOR THE PROJECT

The standards criteria outlined in DEP Rule 17-302 are the detection limit criteria for this project. **The detection limits reported for this project shall at least meet, or be lower than the stated standards.**

FIELD MEASUREMENTS WILL BE PERFORMED BY: ENTEL Environmental Companies, Inc. whose CompQAP # is 930121 with annual amendments approved on 10-15-03.

PARAMETER	**METHOD #**
Not Applicable	

FIELD SAMPLE COLLECTION ACTIVITIES WILL BE PERFORMED BY THE ABOVE NAMED ORGANIZATION.

LABORATORY ANALYSES WILL BE PERFORMED BY: Severn Trent Services, FDEP CompQAP# 990102.

				QUALITY CONTROL SUMMARY					QA TARGETS*		
FREQUENCY	**SAMPLE MATRIX**	**SAMPLE SOURCE**	**# SAMPLES**	**TB**	**EB**	**FD**	**ANALYTICAL METHOD #**	**COMPONENT**	**P**	**A**	**MDL**
Bi-Weekly	Water	Surface Water	15	0	2	2	SM 4500-PF	Total P	5%	10%	0.01 mg/l
Monthly	Water	Surface Water	15	0	2	2	EPA 160.2	Total TSS	5%	10%	1.0 mg/l
Monthly	Water	Surface Water	15	0	2	2	SM 9222D	Fecal Coliform	5%	10%	1.0 CFU/100ml

TB - Trip Blank
EB - Equipment Blank
FD - Field duplicate
P - Precision
A - Accuracy
MDL - Method Detection Limit

*These values need to be completed if the Data Quality Objectives stated in the project description are different from the routine QA objectives cited in the CompQAP(s) or are not included in the CompQAP(s).

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3.3 Project Organization

3.3.1 Project Organization – Sample collection activities will be conducted by ENTEL Environmental Companies, Inc. (ENTEL) with assistance from Soil & Water Engineering Technologies (SWET) on an as needed basis. The Laboratory analytical work will be performed by Severn Trent Services, 10200 USA Today Way, Miramar, FL 33025

Refer to Figure 3.1, "Project Organization" for specific organization of this project.

3.3.2 Personnel Modifications or Additions – The following personnel are not included in the CompQAPs of the referenced organizations (include brief description of project responsibilities);

A. Field Personnel
   1. None
   2.

B. Laboratory Personnel
   1. None
   2.

3.4 Project Objectives

3.4.1 Data Quality Objectives

__X__ The data quality objectives for this project are the routine QA targets listed in the laboratory CompQAP.

_____ The minimum detection limits to be achieved for this study differ from the routine detection limits specified in the laboratory CompQAP and are included as a part of Table 3.2.

_____ The precision and accuracy requirements differ from the routine targets specified in the laboratory CompQAP and are included as a part of Table 3.2.

3.4.2 Proposed samples for project
   a. See Figure 3.2 for a map of the project site.
   b. See Table 3.2 of this Section for a summary of the sampling and analyses activities.

3.4.3 Summary of Matrix Types, Analytical Methods and QA Targets

Field and laboratory analytical measurements are presented in Table 3.2.

Figure 3.1

Project Organization

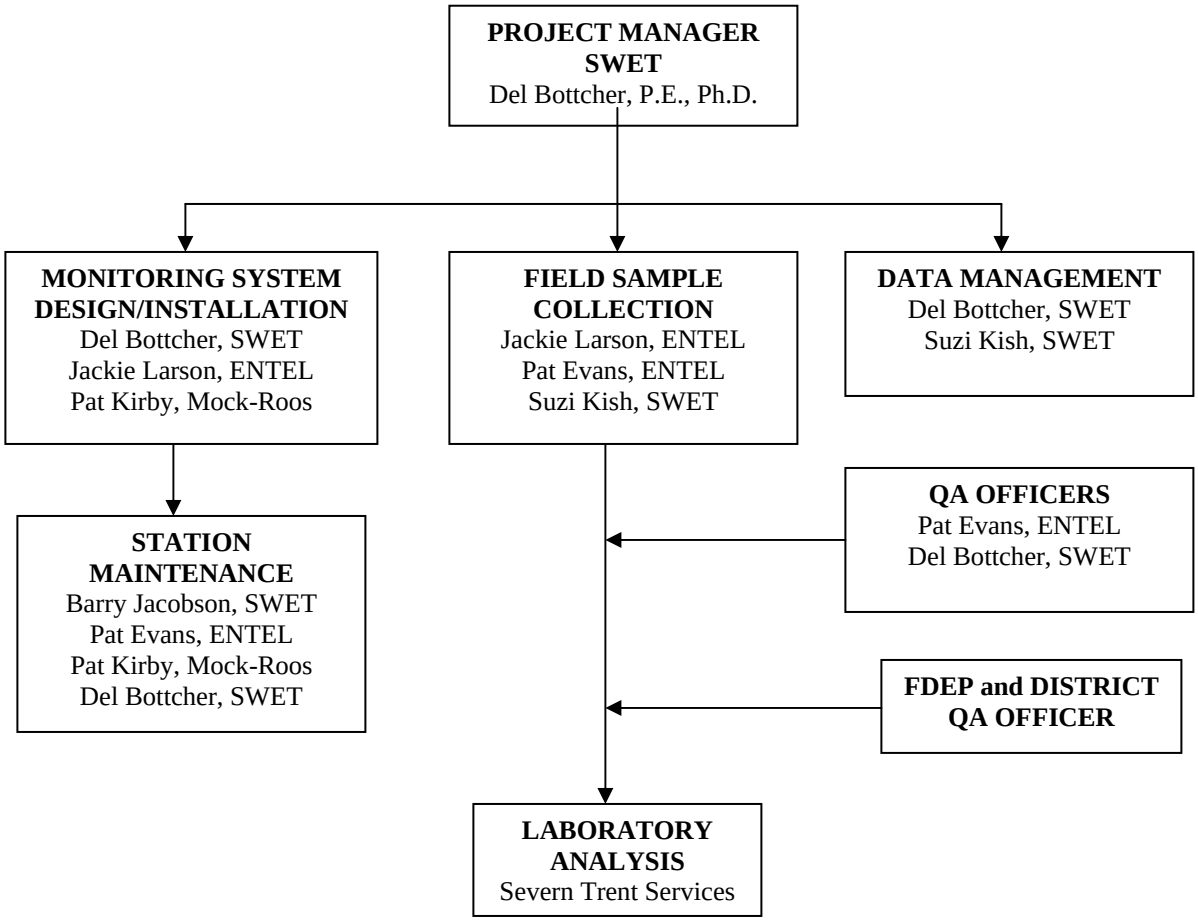
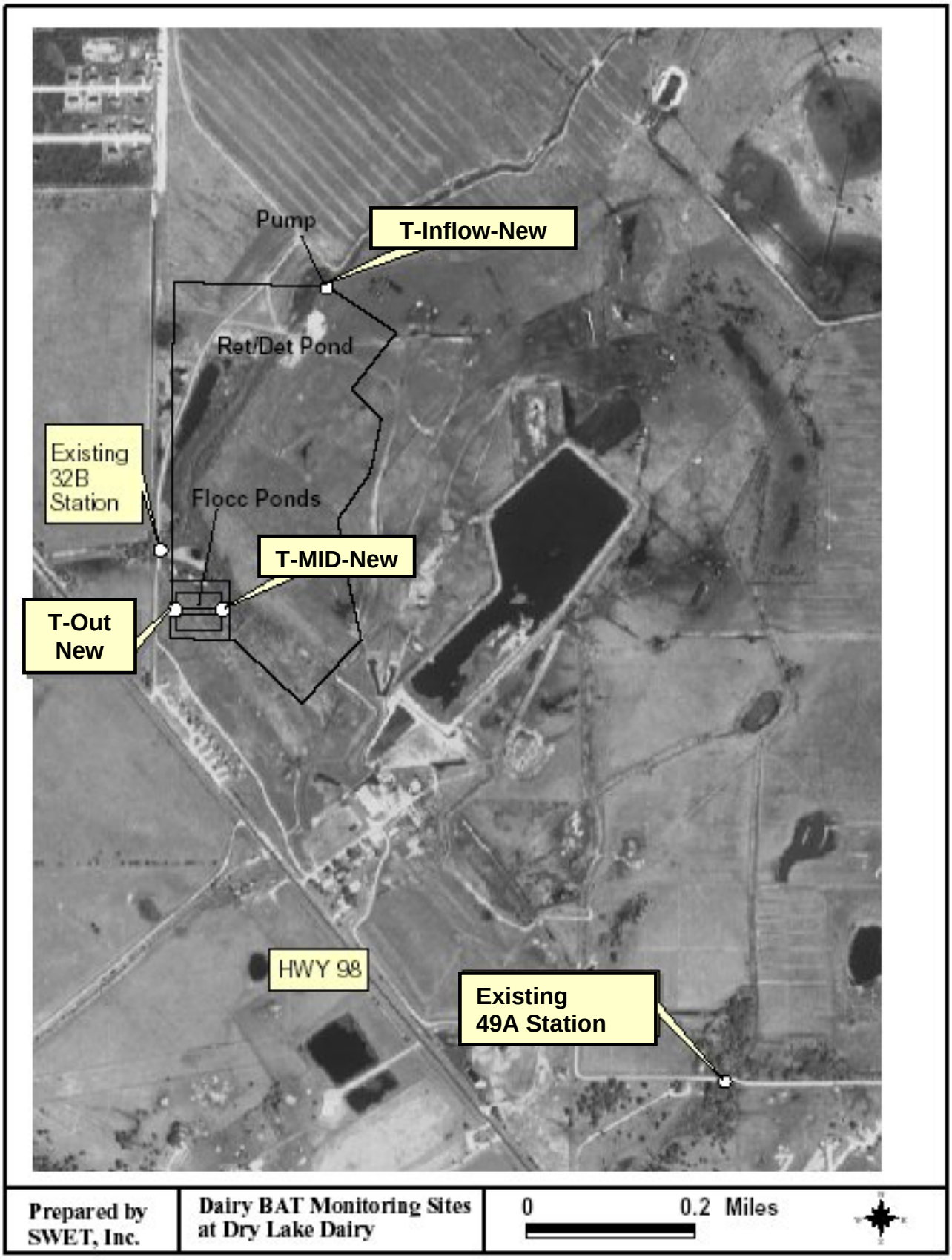


Figure 3.2. Map of Project Site (Dry Lake Dairy.)



Section 4.0 **FIELD PROCEDURES AND QUALITY CONTROL**

This section specifies the protocols and procedures to be used by ENTEL Environmental Companies, Inc. (ENTEL) with assistance from Soil & Water Engineering Technologies (SWET) when conducting sampling activities for this project.

4.1 Sampling Equipment

See Table 4.1 for a list of the equipment to be used for this project.

4.2 **Field Activities** – See Table 4.2

4.2.1 Sampling protocols for this project that are not specified by the CompQAP specified in Table 4.2 include the following

1. A 24-hour holding time wavier was authorization in writing by SFWMD & FDEP for Fecal Coliform
2.
3.

4.2.2 Disposal protocols for handling wastes differ from those specified by the CompQAP. Wastes will be handled according to the following protocols:

1. (not applicable)
2.
3.

4.3 Field Measurements

Field measurements are listed in Table 3.2 of this QAPP. Field screening measurements that will be made are:

1.
2.
3.

TABLE 4.1

PROPOSED SAMPLING EQUIPMENT

The following equipment will be used ENTEL Environmental Companies, Inc. for this project. With the exception of the additional equipment, discussions on use and restrictions are included in CompQAP # 930121 with annual amendments approved on 10-15-03.

EQUIPMENT DESCRIPTION	CONSTRUCTION MATERIALS	USE
Purging Equipment (include construction of tubing, tail pipes, etc.)		
1. None		
2.		
3.		
4.		
5.		
Sampling Equipment		
1. Sample Bottles Provided by Laboratory	Plastic (Inorganic anions and TSS)	
2. ISCO Model 6712 Compostie Autosampler	Tygon tubing, polyproplylene bottle	
3. whril-pac bag	Plastic (for fecal samples)	
4.		
5.		
6.		
7.		

Additional equipment not addressed in the CompQAP includes[1]:

1. Teflon Dip Rod
2.
3.
4.

[1]If the sampling protocols for using this equipment are not included in the cited CompQAP, the sampling protocols must be discussed in Section 4.2.1 of this Quality Assurance Project Plan.

Field Measurement Equipment (construction does not need to be specified)

1.
2.
3.
4.
5.

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TABLE 4.2
FIELD ACTIVITIES

The following field protocols will be used by ENTEL Environmental Companies, Inc.

The Comprehensive QA Plan number for this organization is 930121 with last annual amendments

approved on 10-15-00.

All protocols, procedures and policies in the above-mentioned document which are pertinent to this Quality Assurance Project Plan will be followed and are summarized below:

	VOCs	Extr. Org.	Metals	Inorg. Anions	Org.	Phys. Prop.	Micro	Other (Specify)
Groundwater								
Groundwater (in-place plumbi								
Potable Water								
Surface Water				X		X		X (Fecal Coliform)
Soil								
Sediment/Sludges								
Automatic Samplers								
Field Filtration								
Wastewater				X		X		X (Fecal Coliform)
Stormwater runoff				X		X		X (Fecal Coliform)

SAMPLE CONTAINERS

Sample containers will be supplied by: Severn Trent Services, 10200 USA Today Way, Miramar, FL 33025, FDEP CompQAP# 990102

X Sample containers will be prepreserved by the above-referenced organization and additional acid will be provided; **OR**
X Field organizations will preserve samples on site using protocols outlined in the CompQAP.

EQUIPMENT DECONTAMINATION

Equipment decontamination will follow protocols outlined in the above-referenced CompQAP.*

EQUIPMENT SHALL BE PRECLEANED PRIOR TO ON-SITE ARRIVAL

* **If more than one organization is involved with these activities, this QAPP must specifically identify the equipment and/or sample containers to be provided by each organization.**

WASTE DISPOSAL

X The procedures for handling wastes from equipment cleaning and from sampling are discussed in the above-referenced CompQAP.
___The disposal procedures for handling wastes for this project differ from those outlined in the above referenced CompQAP and are outlined in Section 4.2.2.

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5.0 LABORATORY PROCEDURES AND QUALITY CONTROL

The laboratory analysis shall be conducted by Severn Trent Services, 10200 USA Today Way, Miramar, FL 33025. The Comprehensive QA Plan numbers for these organizations are FDEP CompQAP# 990102. The date of the last update approval is 2003.

All protocols, procedures and policies in the above-mentioned document, which are pertinent to this Quality Assurance Project Plan, shall be followed. The laboratory shall analyze the samples for this project by the methods specified in Table 3.2 of the QAPP.

5.1 Quality Control Checks

The types of laboratory control checks that will be used when analyzing samples for this project are:

Chemical:

_____ Reagent Blanks
_____ Duplicate Samples
_____ Duplicate Matrix Spikes
_____ Continuing Calibration Standards
_____ Other: _____
_____
_____ Matrix Spikes
_____ QC Check Samples
_____ QC Check Standards

Microbiology:

_____ Duplicates
_____ Carry-over Blanks (MF)
_____ Positive & Negative Controls
_____ Other: _____
_____
_____ Control Blanks (MF)
_____ Dilution Blanks (MPN)

6.0 QUALITY ASSURANCE MANAGEMENT

6.1 Corrective Actions

In addition to corrective actions cited in the approved CompQAP, **ALL INVOLVED PARTIES WILL INITIATE ANY CORRECTIVE ACTION DEEMED NECESSARY BY DEP.**

6.2 Performance and System Audits

6.2.1 Field Activities

Specific audits planned for this project are:

Audit Type Description	Frequency/Date
1. None	
2.	
3.	

6.2.2 Laboratory Activities

Specific audits planned for this project are:

Audit Type Description	Frequency/Date
1. None	
2.	
3.	

ALL INVOLVED PARTIES WILL CONSENT TO AUDITS BY DEP IF DEEMED NECESSARY.

6.3 Quality Assurance Reports

Project specific QA reports will be submitted to Jim Laing, Project Manager, SFWMD at a frequency of Quarterly.

Note: Frequency must comply with Table IV, Appendix D of the DEP Manual for Preparing Quality Assurance Plans or Table 6 of Chapter 62-160, F.A.C., Quality Assurance.